



Original communication

The review of autopsy cases of accidental childhood deaths in Istanbul

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ABSTRACT

Children are at increased risk for various causes of injury from accidents. Accidents are, by far, the leading cause of death among children and adolescents. The aim of this study is to evaluate the lethal childhood accidents in Istanbul by age groups. Reports of autopsies performed between 2001 and 2005 in the Morgue Department of the Council of Forensic.

Medicine in Istanbul (n :16853) are examined retrospectively. 833 deaths from accidents in children aged 0–18 years are investigated into the study. The parameters of age, gender, types of accidents and causes of death are evaluated. The accidents account for 47.3% of the deaths among children aged 0–18 years. Of 833 cases, 601 (73%) are male and 232 (27%) are female. The female to male ratio is 1/2.6. The highest rate of death from accidents is at the group of 15–18 years. The primary causes of accidental childhood deaths are motor vehicle accidents (23.1%), followed by drowning (20.1%), poisoning (15.7%), and fall from height (15.5%). The incidence and types of trauma vary with socio-economic status and culture. Istanbul, where this study is conducted in, has approximately 3000 autopsy number annually. Therefore, it provides an important database.

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1. Introduction

Children are at increased risk for various causes of injury from accidents. The infant and the child are unable to avoid from potentially dangerous positions that may not present a danger to an adult. This is the result of having poor physical strength, small body corpus, difficulty in coordination and being inexperience. Accidents account for most sudden deaths in childhood and adolescence.¹ In the United States, where childhood injury rates are high, accidents are responsible for nearly 50% of deaths in the age range of 1–24 years, and 71% of deaths between the ages of 15 and 19 years.² Although the percentages for the different categories vary among studies, common causes of accidental death of children are crashes, drowning and fires/burns.^{2–4} Crashes in the USA are most frequently caused by drunk drivers.⁵ Drowning is the second most common

cause of accidental death in infancy and childhood, ranking behind crashes, and is the leading cause of death in children under the age of 5 in Australia and parts of the United States.^{6–8} In most series, males outnumber females and children most at risk are pre-schoolers 0–4 years old, adolescent males 15–18 years old.^{9–12}

For children under 1 years of age, accidental mechanical asphyxia is a significant cause of preventable deaths. Byard reported that accidental asphyxia due to unsafe sleeping circumstances is 11%.¹

Types of injuries vary with location –urban and rural– and socio-economic status. The morbidity and mortality data related with accidents in childhood helps to prepare prevention programs. The aim of this study is to evaluate the lethal accidents in childhood in Istanbul by age groups.

2. Materials and methods

The autopsy reports of the Morgue Department of Council of Forensic Medicine in Istanbul between 2001–2005 (n: 16853) are evaluated retrospectively. There are 1761 autopsy cases aged 0–18

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years between 2001 and 2005. The origin of death classified as accident, homicide, suicide, natural and unknown is evaluated based on legal investigations, autopsy reports and laboratory results. 833 of the deaths from accident are included in this study. The cases are assigned into the age groups, 0–12 months, 1–4 years, 5–9 years, 10–14 years and 15–18 years. Age, gender, types of accidents and causes of death are evaluated.

3. Results

There are 833 child autopsies from accidental deaths in Istanbul for five years. Accidents account for 47.3% of the deaths among children aged 0–18 years.

Of 833 cases, 601 (73%) are male and 232 (27%) are female. The female to male ratio is 1/2.6.

Table 1 shows the accidents by age groups and gender. The primary cause is the crashes (23.1%) (Table 1).

Of all deaths from crashes, 26% are female, 74% are male and 30.1% are aged 5–9 years. Of all cases of drowning, 15% are female, 85% are male and 44.3% are aged 15–18 years. Of all cases of fall from height 36% are female, 64% are male and 39.5% are aged 1–4 years. Out of cases of burns, 36% are female, 64% are male and 51.1% is aged 1–4 years. Of all cases of poisoning, 36% are female and 64% are male 32.1% are aged 15–18 years. Cases of poisoning except for CO poisoning are shown in Table 2. Blast is the cause of death for five cases, occupational accident is the cause of death for four cases and for another case the cause of death is falling on an iron rod. The asphyxia deaths are shown in Table 3. Suffocation in a septic tank in 2 cases and compression on the neck in 5 cases are the other asphyxia causes.

Table 2

Cases of poisoning except for CO.

Types poisoning	N
Drugs	5
Corrosive substances	4
Mushrooms	4
Narcotics	3
Natural gas	3
Food	2
Methanol	1
Total	22

All cases are tested for toxicology and for ethyl alcohol. Toxicological analyses showed ethyl alcohol ranging between 14 and 276 mg/dl in 21 cases. These are the cases of drowning (n: 15), crashes (n: 2), poisoning (n:3) and electrocution (n:1).

4. Discussion

According to data from the Turkish Statistics Institute, only 14% of the children aged 0–18 years died of accidents by 2005. This ratio is attributed to high rates of natural deaths in Turkey. Since the study sample included autopsies requested by the legal authorities, the rate of deaths from accidents is high in this study as 47.3% between 2001 and 2005. Maloney et al. reported 42.2% of the deaths at the age of 0–12 years to be caused by accidents.¹³

Boys are involved in 73% of the cases. This ratio can be explained by the fact that boys are more inclined to participate in social activities that may expose them to trauma. This ratio is comparable to national and international studies.^{4,14–21}

Table 1

Distribution of accidents by age groups and gender.

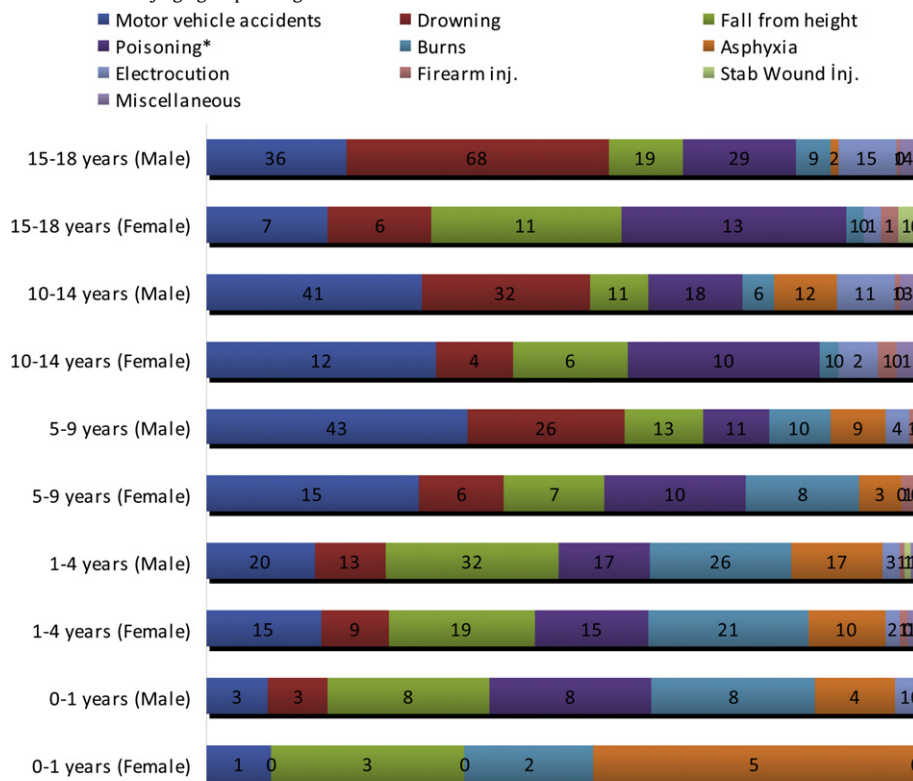


Table 3
Causes of asphyxia.

Foreign body aspiration	Hanging	^a Miscellaneous	Traumatic asphyxia (Compression on the chest and abdomen)	^a Other causes of asphyxia	Total
14	5	7	36	7	62

^a Death was caused by suffocation in a septic tank in 2 cases and compression on the neck in 5 cases.

The 15–18 years old group constitutes the majority among similar studies. A comparable study in Turkey indicated that 39% of all accident related deaths are at the age of 15–18 years.²¹ Byard et al. also found that 71% of the deaths at the age of 15–19 years were caused by accidents.¹ The study also showed high amount of cases at the age of 1–4 years along with at the age of 15–18 years. Children at the age of 0–4 years are more frequently exposed to trauma. In the early years of life, babies grasp and taste things and tend to swallow them. In the early developmental stages, their gastrointestinal and respiratory systems can easily be obstructed.²²

The leading causes of death among the 1–4 year olds are fall from height, poisoning and asphyxia. Agran et al.²² reported the most frequent causes of deaths at this age group to be poisoning, burns and falls. In the present study, the first and the second most common cause of deaths are fall from height and burns among 1–4 year olds.

The most frequent cause of death among children younger than 1 year is preventable mechanical asphyxia.¹ Agran et al.²² reported the most frequent cause of death to be fall from height followed by asphyxia among children younger than 1 year. In the present study, the leading cause of death among children younger than 1 year is fall from height (23.9%).

Consistent with the literature,^{21,23–27} crashes are the most frequent type of lethal accidents (23%). However not, all deaths with a legal aspect are subjected to autopsy in Turkey. Several studies have revealed that only 1.5–2% of all deaths related to crashes are autopsied^{28–30} in Turkey. Since the cases included in this study are only the autopsied ones, the real rate may be higher than 23%.

In this study crashes accounted for 30.5% and 27.5% of the deaths at the age of 5–9 years and 10–14 years respectively. Agran et al. reported that death was most frequently caused by poisoning, sport accidents and motor vehicle accidents at the age of 10–14 years and that sport accidents and motor vehicle accidents at the age of 15–19 years.³¹ Laraque et al. also found that 41% of the traumatic deaths at the age of 15–19 years were caused by motor vehicle accidents.³² This study showed that the rate of deaths from crashes at the age of 15–18 years is low, unlike the other studies. It may be attributed to the low rate of alcohol consumption among adolescents aged 15–18 years in our country. In fact, none of them had alcohol in their blood in this age group.

Several studies have shown a decrease crashes but an increase in drowning and burns.^{1,6} Drowning is the second most common cause of child deaths.⁶ This study also showed 20% of lethal accidents to be drowning related. It is a leading cause of death among children younger than 5 years in Australia and the USA.^{7,8} In this study, of all deaths from drowning, 44.3% are at the age of 15–18 years and 85% were boys. Unfortunately this is due to the fact that most adolescents cannot swim in our country.

Poisoning accounted for 15.7% of all deaths in this study and 32.1% of the deaths at the age of 15–18 years. Most of them are caused by CO poisoning. There is not a significant difference in CO poisoning between the age groups. It may be due to the fact that charcoal is used for heating at home in most of the cases included in the study. In fact, CO poisoning is frequently encountered in Turkey because charcoal is still widely used for heating.

The third most common lethal accidents are fall from height. Of all deaths from fall from height, 39.5% occurred at the age of 1–4 years.

Autopsy should be performed in all deaths from accidents and it should be done in accordance with established standards. Crime scene investigations and autopsy should be carried out by an expert or the same forensic medicine specialist. Obtained data should be kept appropriately. They can be used to formulate strategies for accident prevention programs. Clinical history is also of great importance in lethal accidents. In fact, autopsy findings in both accidental and non-accidental asphyxias are non-specific.¹ Therefore, a thorough clinical history should be taken and crime scene investigation should be performed for differential diagnosis.

There is no standard autopsy protocol for accidental deaths in Turkey. Due to lack of standard autopsy protocol during the period of the study, the origin of death couldn't be determined for 12% (211 cases) of the cases among 0–18 year olds. Currently, there are some efforts to meet the autopsy protocol standard of the European Council of Legal Medicine, which is believed to fit our country's conditions the best.³³

Parents may not be aware of all health threats to their children. However, they can be offered training and taught what they can do in certain situations. In addition, expert views can be useful in preparing prevention programs.¹

In recent years, accident prevention programs have become important. They are especially directed towards parents with low socio-economic status and their neighbours.³⁴ Low socio-economic status is associated with injuries, which affects application of prevention programs.

The incidence and types of trauma vary with socio-economic status and culture. As a result, risk factors of trauma and prevention programs will differ between people. European countries have achieved a decrease of 50% in child deaths from injuries and in Sweden child deaths are decreasing. However, accident prevention programs should be continued especially in young age groups vulnerable to injuries and neglect.

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None.

Conflict of interest

None declared.

References

- Byard RW. Accidental childhood death and the role of the pathologist. *Pediatr Dev Pathol* 2000;**3**:405–18.
- Byard RW, Cohle SD. *Sudden death in infancy, childhood and adolescence*. Cambridge, UK: Cambridge University Press; 1994.
- Colombani PM, Buck JR, Dudgeon DL, Miller D, Haller MA. One-year experience in a regional pediatric trauma center. *J Pediatr Surg* 1985;**20**:8–13.
- Peclet MH, Newman KD, Eichelberger MR, Gotschall CS, Guzzetta PC, Anderson KD, et al. Patterns of injury in children. *J Pediatr Surg* 1990;**25**:85–91.
- Rosenberg ML, Rodriguez JG, Chorbha TL. Childhood injuries: where we are. *Pediatrics (Suppl)* 1990;**86**:1084–91.
- Somers GR, Chiasson DA, Smith CR. Pediatric drowning. A 20-year review of autopsied cases: I. demographic features. *Am J Forensic Med Pathol* 2005;**26**:316–9.
- Silva DT, Ruben AR, Wronski I, Stronach P, Woods M. Excessive rates of childhood mortality in the northern territory, 1985–1994. *J Pediatr Child Health* 1998;**34**:63–8.
- Witernute GJ. Childhood drowning and near drowning in the United States. *Am J Dis Child* 1990;**144**:663–9.
- Zuckerman GB, Conway EE. Drowning and near drowning: a pediatric epidemic. *Pediatr Ann* 2000;**29**:360–6.
- Langley JD, Warner M, Smith GS, Wright C. Drowning-related deaths in New Zealand, 1980–1994. *Aust N Z J Public Health* 2001;**25**(5):451–7.
- Nieves JA, Buttacavoli M, Fuller L, Clarke T, Schimpf PC. Childhood drowning: review of the literature and clinical implications. *Pediatr Nurs* 1996;**22**(3):206–10.

12. Mackie IJ. Patterns of drowning in Australia, 1992–1997. *Med J Aust* 1999;**171**(11–12):587–90. 6–20.
13. Maloney D, Keller SJ, Fierro MF. Child deaths in Virginia, 1996: a review of investigations of sudden, unexpected, or unnatural deaths of children less than age 13. *Am J Forensic Med Pathol* 2000;**21**(2):189–94.
14. Aksoy E, Inanıcı A, Colak B, Polat O. Çocuk ölümleri. I. Adli Bilimler Kongre Kitabı, Adana; 1994. pp. 233–235.
15. Cekin N, Bilgin N, Gulmen MK, Alper B, Hilal A. 1992–1995 yılları arasında yoremizde izlenen çocukluk çağı adli ölüm olgularının değerlendirilmesi. VI. Ulusal Halk Sağlığı Kongresi, Poster Sunumu, 14–18 Nisan 1998, Adana.
16. Grass H, Madea B. Child homicide in Cologne (1985–1994). *Forensic Sci Int* 1996;**79**:131–44.
17. Karagoz YM, Atilgan M, Karagöz SD, Akman R. Adli Çocuk otopsipleri. *Adli Tip Bulteni* 1999;**4**(3):120–2.
18. MacKellar A. Deaths from injury in childhood in Western Australia 1983–1992. *Med J Aust* 1995;**162**:238–42.
19. Parkkari J, Kannus P, Niemi S, Koskinen S, Palvanen M, Vuori I, et al. Childhood deaths and injuries in Finland in 1971–1995. *Int J Epidemiol* 2000;**29**:516–23.
20. Salacin S, Alper B, Cekin N. Adana'da fatal sonlanan çocukluk çağı kazalarının yoresel özellikleri. *Adli Tip Dergisi* 1992;**8**:125–30.
21. Turkmen N, Fedakar R. yılları arasında Bursa'da otopsi yapılan dogal olmayan çocuk ölümleri. *Anadolu Tip Dergisi* 2002;**4**(3):142–51. 1996–2001.
22. Agran PF, Anderson C, Winn D, Trent R, Walton-Haynes L, Thayer S. Rates of pediatric injuries by 3-month intervals for children 0 to 3 years of age. *Pediatrics* 2003;**111**:683–92.
23. Cooper SP. Childhood injury deaths in texas: a major health problem. *Tex Med* 1989;**85**:29–33.
24. Fingerhut LA, Kleinman JC, Malloy MH, Feldman JJ. Injury fatalities among young children. *Public Health Rep* 1998;**103**:399–405.
25. McIntosh G, Moreno M. Fatal injuries in adolescents. *WMJ* 2000;**99**:34–8.
26. Rausch TK, Sanddal ND, Sanddal TL, Sanddal TL, Esposito TJ. Changing epidemiology of injury related pediatric mortality in rural state: implications for injury control. *Pediatr Emerg Care* 1998;**14**:388–92.
27. Rivara FP. Epidemiology of violent deaths in children and adolescents in the United States. *Pediatrician* 1983–85;**12**:3–10.
28. Akar T, Yavuz Y, Demirel B, Senol E, Egilmez L. Diyarbakir'da 2000–2004 yılları arasında meydana gelen dogal nedenlere bagli olmayan ölümler. *Turkiye Klinikleri J Foren Med* 2006;**3**:94–100.
29. Demirel B, Akar T, Ozdemir C, Canturk N. Trafik kazası sonucu ölümlerde otopsi kararını etkileyen nedenler. *Adli Tip Bulteni* 2005;**10**(3):77–83.
30. Gören S, Subasi M, Tirasci Y, Kaya Z. Trafik kazalarına bagli ölümler. *T Klin Adli Tip Der* 2005;**2**(1):9–13.
31. Agran PF, Winn D, Trent R, Anderson C, Trent R, Walton-Haynes L. Rates of pediatric and adolescent injuries by year of age. *Pediatrics* 2001;**108**(3):E45.
32. Laraque D, Barlow B, Durkin M. Prevention of youth injuries. *J Natl Med Assoc* 1999;**91**:557–71.
33. *Harmonization of the performance of the midicolegal autopsy*. London: European Council of Legal Medicine, ECLM, www.irm.unizh.ch/eclm/files/autopsy; 1994–1995.
34. Kendrick D, Watson M, Mulvaney C, Burton P. How useful are home safety behaviours for predicting childhood injury? A cohort study. *Health Educ Res* 2005;**20**(6):709–18.